BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

(12) UK Patent Application (19) GB (11) 2 195 206 (13) A

(43) Application published 30 Mar 1988

(21) Application No 8719806

(22) Date of filing 21 Aug 1987

(30) Priority data
(31) 8620393 (32) 21 Aug 1986 (33) GB

(71) Applicant
British Aerospace Plc

(Incorporated in United Kingdom)

Brooklands Road, Weybridge, Surrey KT13 0SJ

(72) Inventor
Carl Thomas Victor Blenkhorn

(74) Agent and/or Address for Service
Gallafent & Co,
8 Staple Inn, London WC1V 7QH

(51) INT CL⁴
H01H 13/52 9/16

(52) Domestic classification (Edition J):
H1N 553 61X 625 740 741 747 854 PKC PW
U1S 1839 2284 2285 H1N

(56) Documents cited
GB A 2140210 GB 0900328 US 4496813
GB 1559495 EP A1 0163782
GB 1121420 EP A2 0149086

(58) Field of search
H1N
Selected US specifications from IPC sub-class H01H

(54) Pushbutton operated microswitch with display function

(57) An improved function indicating switch is disclosed in which a push button (5) having a transparent lens portion (14) protrudes from a hole in a panel (18), the push button (5) being held in the hole by a flange (20) which is retained against the underside (17) of the panel by a microswitch (9) on one side and a resilient member (11) on the other. The push button (5) can move independently of a display (15) mounted on an integrated circuit socket (16) and printed circuit board, operating only a plunger (27) of the microswitch (9). The resilient member (11) returns the pushbutton (5) to its unoperated position, and is mounted on only the wall (8) or only the flange (20).

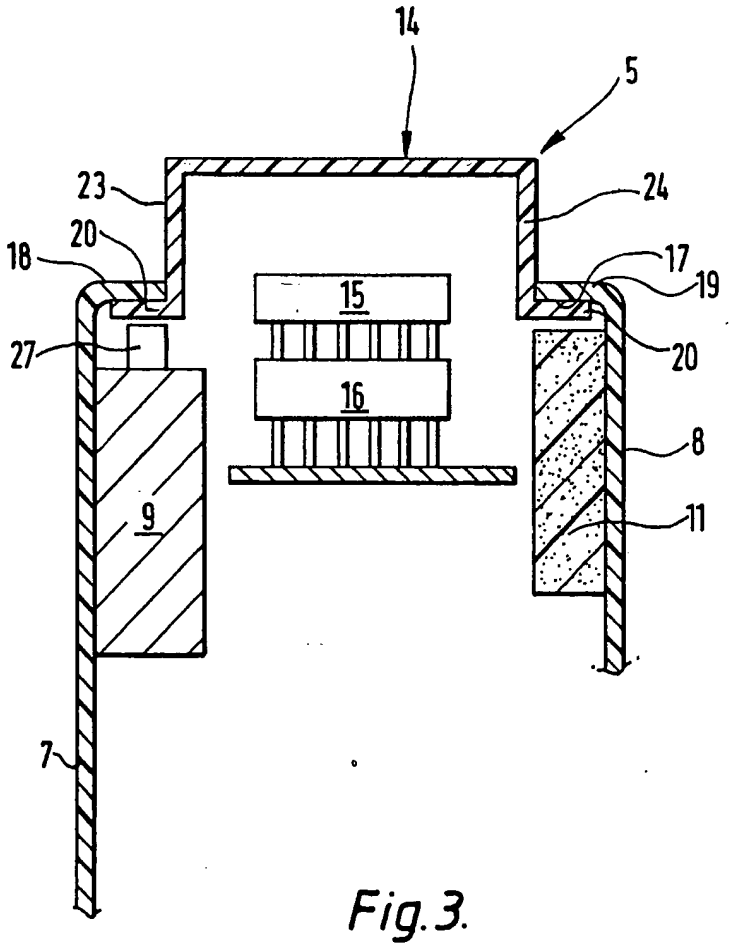

Fig.3.

GB 2 195 206 A

The drawing(s) originally filed was/were informal and the print here reproduced is taken from a later filed formal copy.

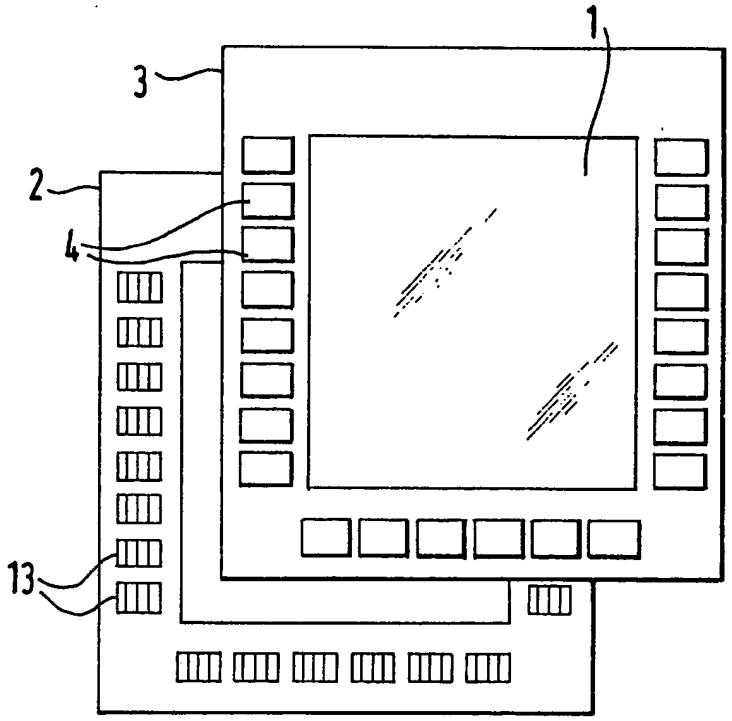

Fig.1.

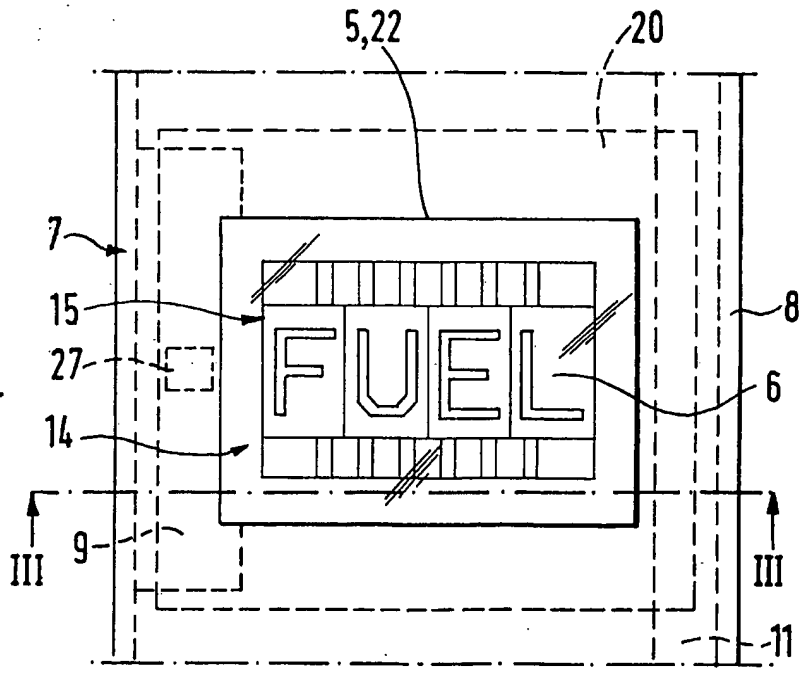

Fig.2.

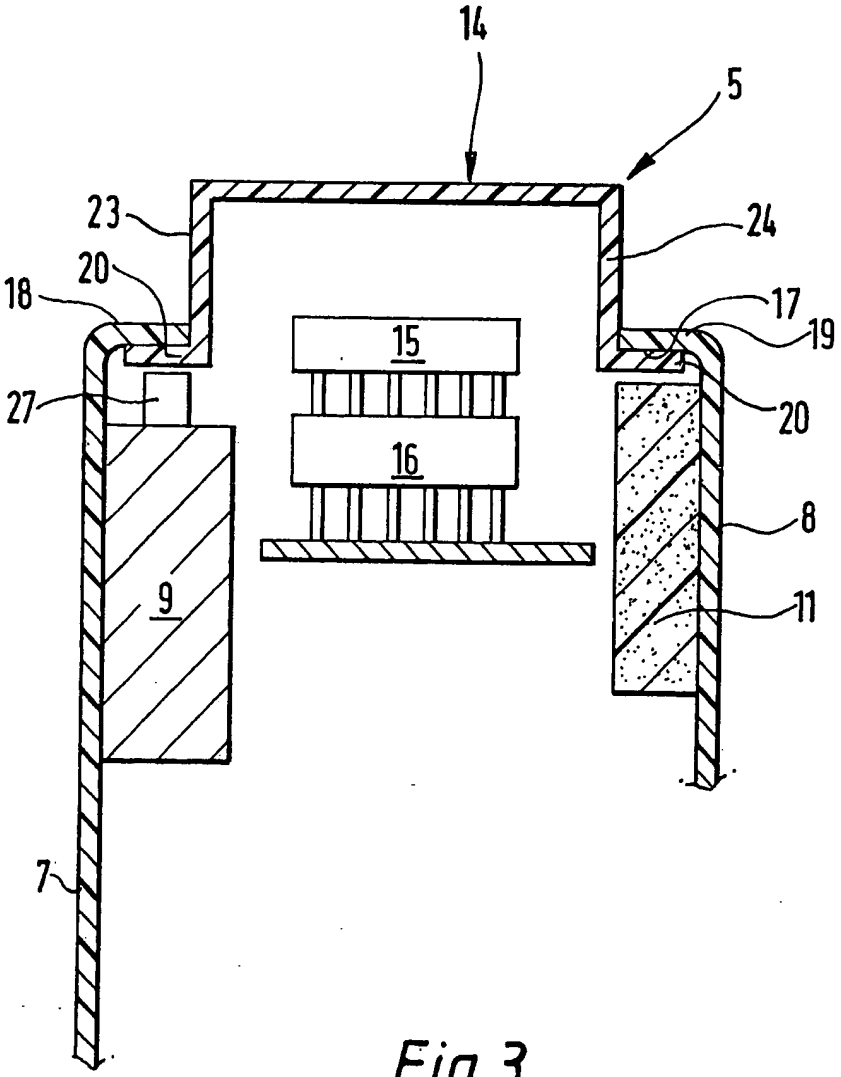

Fig.3.

SPECIFICATION

Switches

The present invention relates to switches in particular to function indicating switches which can be used with multi-function displays (MFD) such as colour cathode ray tube (CRT) displays.

MFDs replace numerous individual instruments and displays which were in common use in the cockpits of earlier generation conventional aircraft, and can provide various types of information on demand. The MFD can provide data automatically where it is important and can keep back data which is irrelevant for a particular flight operation. MFDs can operate in raster scan or stroke/write modes or superimpose characters or symbols on a raster display during a raster frame blanking period.

In a typical MFD for a high-speed fighter aircraft, manual function selection switches are used, software controlled by computer to show legends representing selectable ones of a plurality of functions corresponding to the current state of the MFD; the switch faces are blank and the current legends for each switch are displayed along the edges of the display screen adjacent the appropriate peripherally mounted switch. An advantage of displaying the legends on the display screen is that they can be readily changed; however the space occupied by the legends reduces the overall area of the screen which could be used for other information.

Function indicating switches are also known which use a push button with a transparent face covering an alpha-numeric or symbol type display. The push button is hinged at one edge and is biased by an attached spring or similar resilient member towards a neutral non-depressed position. The display is carried by and moves with the push button and is an LED or backlit LCD alpha-numeric/symbol display which is controlled by an integrated circuit driver chip which is in turn controlled by the computer via an integrated circuit alpha-numeric symbol generator according to aircraft situation. The display elements incorporated into the push button are connected to the chip driver by electrical connections which are required to flex when the push button is depressed. Co-operating electrical contacts on the moving and stationary parts of the switch are used to initiate "button depressed" signals for the computer. It would be advantageous to use function indicating switches in association with MFDs, so as to save screen space, but clearly the known types of such switches described above suffer from mechanical wear due to the flexing of the interconnecting leads and the relative movement between the electrical contacts of the "button depressed" sensor.

It is an object of the present invention to overcome the mechanical wear problem associated with known function indicating switches, to provide a switch for a multi-function display of improved reliability, to reduce the overall depth of the switch mechanism, and to increase display screen area by removing function legends from the screen.

According to one aspect of the present invention, there is provided a switch comprising:

mounting means;

a transparent-faced push button which protrudes through a hole in the mounting means;

display means located beneath the transparent face of the push button and fixed with respect to the mounting means;

a microswitch fixed to the mounting means and operable to co-operate with the push button when it is depressed; and

resilient means urging the push button to a rest position and which permits a given amount of relative movement of the push button with respect to the mounting means and returns the push button to its rest position after each depression.

Preferably, the mounting means may comprise a panel having at least two walls extending perpendicularly thereto, the microswitch being attached to one of the walls.

Advantageously, the display means is an alpha-numeric/symbol display which is mounted on an integrated circuit socket attached to a printed circuit board.

The transparent face of the push button may form a lens.

In a preferred embodiment of the invention, the push button carries a flange which co-operates with part of the mounting means to limit movement of the push button in one direction. Movement in the depressed direction is then limited by the co-operation of the resilient means and the flange or the resilient means and the mounting means depending on whether the resilient means is attached to the mounting means or the flange respectively. The flange also co-operates with the microswitch to provide "button depressed" signals to the remote computer whenever the push button is depressed.

According to a second aspect of the invention, there is provided a function indicating push button type switch including a transparent-faced push button, mounting means, an alpha-numeric/symbol display located beneath the surface of the transparent face and fixedly mounted with respect to the mounting means, a microswitch mounted on the mounting means so as to co-operate with a part of the push button whenever the push button is depressed, and resilient means attached to either the mounting means or the push button permitting substantially axial movement, but limiting the extent of such axial movement of the push button in response to, and returning the push button to a neutral position with respect

to the mounting means after, each depression thereof and wherein the display is so located and mounted that it does not move with depressions of the push button.

An embodiment of the invention will now be described by way of example only, with reference to the accompanying drawings in which:

Figure 1 shows a schematic exploded view of parts of a multi-function display (MFD);

Figure 2 shows a planar front view of a function indicating switch used in the MFD of Figure 1; and

Figure 3 shows a section on III-III of the function indicating switch of Figure 2.

In Figure 1, a screen 1 of a cathode ray tube (CRT) forms a multi-function display (MFD), and is surrounded by a panel 3 in which are mounted twenty-two function indicating switches 4. The panel 3 has two perpendicularly extending wall regions 7 and 8 (shown more clearly in Figure 3). A printed circuit board (PCB) 2 is mounted behind the panel 3 and also surrounds the CRT. The PCB 2 carries twenty-two integrated circuits 13 which are alpha-numeric or symbol generator chips. Each circuit 13 is associated with a respective one of the switches 4, and is controlled by a remote computer, for example, the on-board computer of an aircraft (not shown) in response to signals produced on depression of one or more of the switches 4.

As shown in Figures 2 and 3, each switch 4 comprises a push button portion 5 which is mounted in a rectangular hole 22 formed in the panel 3. The push button portion 5 includes a rectangular lens portion 14 attached to a rectangular flange 20 by walls 23, 24, 25 and 26 (only walls 23 and 24 are shown in in Figure 3). The lens portion 14 protrudes from the hole 22 and the flange 20 is held within the panel 3 against the underside 17 of the panel 3 by a resilient member 11 and a plunger 27 of a microswitch 9, the member 11 and the microswitch 9 being fixed to wall regions 8 and 7 respectively.

Directly behind but spaced from the push button portion 5 are mounted a display 15 and an integrated circuit socket 16, the display 15 and socket 16 being mounted on a further PCB 21 and receiving driving pulses from a driver chip (not shown). The driving pulses are produced in response to signals from the circuits 13 mounted on the PCB 2, which are positioned behind respective ones of the switches 4, the pulses causing a legend 6 to be formed on the display 15 which can be viewed through the lens portion 14 (such as "fuel" as shown in Figure 2). The PCB 2 is positioned so as to "sandwich" the display 15, socket 16 and PCB 21 between the push button portion 5 and the integrated circuit 13, connections between the two boards being made by interconnecting wires (not shown).

The legends 6 may indicate parameters currently shown on the MFD adjacent the switch 4 in question, or commands for selection of the next MFD view. Each switch 4 may display any one of a plurality of legends as determined from time to time by the remote computer which also controls the MFD appropriately.

It will be noted that the flange 20 is not attached to the wall regions 7 and 8 or to the microswitch 9 or resilient member 11, and in a neutral, non-depressed position is merely loosely retained therein by portions 18 and 19 of the panel 3 and the upper surfaces of the resilient member 11 and the operating plunger 27 of the microswitch 9. The degree of looseness with which the push button portion 5 is retained depends on the chosen clearances between these parts.

Depression of push button portion 5 moves the plunger 27 of the microswitch 9 into a switched position but does not move the display 15 and the socket 16. Thus the state of the display 15 and the corresponding function of button portion 5 can be changed without movement of the electrical connections between the display 15 and its socket 16 and with no mechanical flexing and wear. Moreover since the flange 20 does not form a part of the electrical circuit providing "button depressed" signals there is no mechanical wear of any electrical contacts initiating such signals which are provided instead in microswitch 9.

In a further embodiment (not shown), the integrated circuit socket 16 may be mounted directly onto the PCB 2 adjacent its associated integrated circuit 13. In such a case, connections between the socket 16 and the circuit 13 are made via the PCB 2 and no interconnecting wires are required. A rigid assembly may be provided by securing the PCB 2 to an intermediate point on wall region 7 and to the free end of wall region 8.

It will now be appreciated there are many modifications and variations of the particular embodiment of the invention described above. For example, the resilient member 11 could be attached to the lower face of the flange 20 so as to co-operate with an inwardly facing lug forming part of the wall region 8. The screen 1 need not be a CRT but could be a flat panel LED, LCD or electro-luminescent display.

The resilient member 11 may be made from rubber or any other suitable material. It may be in the form of a compression spring, in which case, the material is metal wire.

It will be appreciated that although the invention has been described with reference to the prior use of known switches to an aircraft cockpit display application, switches according to the invention may be used in association with MFDs in a variety of other applications, for example, for industrial control systems.

CLAIMS

1. A switch comprising:

mounting means;

a transparent-faced push button which protrudes through a hole in the mounting means;

display means located beneath the transparent face of the push button and fixed with respect to the mounting means;

a microswitch fixed to the mounting means and operable to co-operate with the push button when it is depressed; and

resilient means urging the push button to a rest position and which permits a given amount of relative movement of the push button with respect to the mounting means and returns the push button to its rest position after each depression.

2. A switch according to claim 1, wherein the mounting means comprises a panel having at least two walls extending perpendicularly thereto, the microswitch being attached to one of the walls.

3. A switch according to claim 2, wherein the resilient means is attached to another wall.

4. A switch according to claim 2, wherein the resilient means is attached to the push button and co-operates with a lug formed in another wall.

5. A switch according to any one of claims 1 to 4, wherein the push button includes a flange which retains it in the mounting means and which flange contacts an actuation member of the microswitch when the push button is depressed.

6. A switch according to any one of the claims 1 to 5, wherein the display means is an alpha-numeric/symbol display.

7. A switch according to claim 6, wherein the alpha-numeric/symbol display is mounted on an integrated circuit socket attached to a printed circuit board.

8. A switch according to any one of the preceding claims, wherein the transparent face of the push button is a lens.

9. A multi-function display including a plurality of switches according to any one of the preceding claims.

10. A function indicating push button type switch including a transparent-faced push button, mounting means, an alpha-numeric/symbold display located beneath the surface of the transparent face and fixedly mounted with respect to the mounting means, a microswitch mounted on the mounting means so as to co-operate with a part of the push button whenever the push button is depressed, and resilient means attached to either the mounting means of the push button permitting substantially axial movement, but limiting the extent of such axial movement of the push button in response to, and returning the push button to a neutral position with respect to the mounting means after, each depression thereof and wherein the display is so located and mounted that it does not move with depressions of the push button.

11. A switch substantially as hereinbefore described with reference to the accompanying drawings.

12. A multi-function display substantially as hereinbefore described with reference to the accompanying drawings.

Published 1988 at The Patent Office, State House, 66/71 High Holborn, London WC1R 4TP. Further copies may be obtained from The Patent Office, Sales Branch, St Mary Cray, Orpington, Kent BR5 3RD. Printed by Burgess & Son (Abingdon) Ltd. Con. 1/87.